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HERBICIDES FOR WEED CONTROL IN VEGETABLE CROPS

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HERBICIDES FOR WEED CONTROL IN VEGETABLE CROPS - 1964

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This mimeo publication has been prepared as a possible guide for Ohio vegetable growers in their development of sound weed control practices during the 1964 season. The suggested weed control practices and general information supplied herein must be carefully evaluated and each grower must determine the practicability of using these weed control measures. Each farm, and each crop-planted area within a farm, will reveal weed problems that are peculiar to that particular situation.

Each grower must know or develop information on the specific weed problems that he expects to encounter in any particular crop planting. Unfortunately, there are many weed problems in vegetable crop production that cannot be solved with presently available chemicals. Growers cannot afford to ignore or forget sound cultural practices that have been used in the past for weed control.

The greatest drawback to successful use of herbicides is a general lack of understanding that "wishing will not make it so." The performance of any chemical is already built into it and its structure and reaction to soil type and environment, as well as its effect on specific crops or weeds, can only function within very narrow limits.

Successful control of weeds in vegetable crop plantings with chemicals probably represents the most complex innovation that vegetable growers have faced in the entire history of vegetable crop production. Notwithstanding these complexities, the Ohio vegetable grower has no choice but to learn to use the best of chemical procedures plus the best cultural procedures for weed control, if he is to survive.

APPLICATION OF HERBICIDES

Herbicides used to control weeds in vegetable crop plantings are applied as (1) pre-plant treatments, before the crop is planted; (2) pre-emergence treatments, applied at time of planting or sometime before the emergence of the crop; or (3) post-emergence treatments, applied after the crop plant has emerged.

In addition to considering the application of an herbicide on a crop status basis, the grower must also take into account, the stage of weed development. Certain herbicides are only effective when applied to the soil before weed seedlings have emerged. Other herbicides may only be effective if applied after weed seedlings have emerged. In a few instances, a particular herbicide may be applied either before or after weed seedlings emerge.

Granular vs Spray Applications:

Some herbicides can be effectively applied either in the granular form or as a spray. In general, spray application equipment is much further advanced

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related to precise placement and distribution of herbicides as compared with the available granular application equipment. Many herbicides provide best weed control when applied as a spray. A few herbicides have provided maximum weed control, with minimum crop damage, when applied in the granular form. Growers should follow specific recommendations for a given chemical as based on crop and environmental conditions in determining whether to spray or apply a granular herbicide. Where granulars are used it is essential that frequent calibration of granular equipment be followed and it is also important that each kind of granular herbicide be separately calibrated.

Band vs Overall Application of Herbicides:

The major purpose of applying a band of herbicide over the row area is to reduce the cost of herbicide per acre. With horticultural crops, it is probably not worth while to use band applications where row spacings are less than thirty to thirty-six inches. Weed growth not eliminated by cultivation, in the non-treated area between narrow row spacings, can often be as troublesome as if none of the area had been treated.

Growers who plan to use band applications must realize that there can be a major difference between the rate of herbicide used per acre and the amount of herbicide used per acre.

ALL RATES PER ACRE SUGGESTED IN THE FOLLOWING OUTLINE ARE BASED ON COMPLETE OR OVERALL COVERAGE OF THE ACRE.

If one plans to apply an eighteen-inch band over a row crop, with thirty-six inch spacing between rows, he should apply one-half the amount recommended for the entire acre. With band applications of herbicides, the actual area of the acre treated will determine the amount of herbicide to be used per acre. The rate of herbicide usage per acre should never be increased, since safe and legal use of chemicals for weed control are usually based on the rate per acre recommended.

A grower can reduce the amount of herbicide (below that recommended) that he applies to any given acre, based on experience or based on a proportional reduction in land area treated. In no case should a grower exceed the recommended rate per acre for any chemical based on the actual area treated.

Soil Residue of Herbicides and Their Effect on Subsequent Planted Crops:

Some chemicals suggested for weed control in vegetable crops have a soil residual hazard (as far as subsequent planted crops) of less than twenty-four hours. Other suggested chemicals may affect the growth of later planted crops, if the treated area should be replanted to these crops within one to six weeks after the chemical had been applied to the soil. A few chemicals used in vegetable crop plantings may result in mild to severe damage to certain subsequent planted susceptible crops for periods up to possibly twelve months.

In other words, certain herbicides could be applied to vegetable crops or soils and the area be re-planted with almost any crop within twenty-four hours after the treatment. There are other instances where the replanting

of some crops, in treated areas, might involve a certain hazard for a period of one to six weeks. In a very few instances, this soil residual hazard could be of concern for up to twelve months.

Many research people have been concerned with the potential soil residual hazard associated with the use of weed control chemicals. Persons responsible for developing recommendations for chemical weed control with vegetable crops have always considered this problem.

Ohio Vegetable growers should be concerned with this potential hazard of soil residue of herbicides used in vegetable crop production. Their concern, however, should be directed at more critical examination of their application procedures. Our research results to date, do not indicate that there is a major problem in soil residue hazards, where chemicals have been properly applied. Many of the "soil residual problems" that we have seen, have involved "poor application methods."

Be sure that you apply the correct rate per acre of an herbicide, based on the actual area treated, the kind of crop, and recommended time of application. If you do this, most of the residual soil hazards of herbicides will disappear.

Factors that Control Accurate Application of Herbicides:

It is essential to know the "percent active ingredient" in any commercial herbicide product. For instance, a particular herbicide may be formulated as a fifty per cent wettable powder. With this product, if you wished to apply it at the rate of one pound per acre, you would have to use two pounds of the commercial product. Another herbicide might be formulated as a liquid, containing two pounds active ingredient per gallon of commercial product. If you wished to apply this material at the rate of one pound per acre, you would use only one-half gallon of the commercial product.

Some granular herbicides are formulated with four per cent active ingredient. If you wished to apply this commercial product at the rate of one pound per acre, it would require twenty-five pounds of this four per cent material.

ALL RATES PER ACRE SUGGESTED IN TABLE 3 ARE BASED ON POUNDS OF ACTIVE INGREDIENT. Thus, you must make comparable calculations as indicated above.

The Sprayer: Sufficient agitation must be maintained in the spray tank, so the first gallon of spray discharged has the same concentration of herbicide as every other gallon, right down to the last gallon sprayed. Without good agitation, stratification or layering out of the herbicide can occur in the spray tank. If this occurs, some of the land area sprayed may receive such a low rate of herbicide per acre that none of the weeds will be controlled. On the other hand, some of the treated area may receive such a high rate per acre of herbicide that the crop plant may be injured and the high concentration of the chemical in the soil may cause damage to subsequent planted drops for periods up to two or three years, depending upon the herbicide used.

Where power for operating the sprayer is supplied from the tractor, power take-off, it is very important to determine whether power demand for the tractor

may cause a fluctuation in the pressure maintained in the spray boom or reduce the efficiency of agitation in the spray tank. Short instances of increased power or loss of power could change the rate per acre of herbicide applied.

The rate per acre delivered through any given nozzle tip, on a spray boom, is controlled by many factors. The nozzle tip must be adjusted to the proper height above soil level so the sprayed area corresponds with the manufacturer's recommendation. If you drop the height of the nozzle tip and cover a smaller strip of soil, you will be applying a greater rate per acre of herbicide, assuming you control all other factors.

If you are supposed to maintain a tractor-sprayer speed of four miles per hour, but because of mechanical difficulties or as you approach ends of rows, you reduce the speed of the rig to two miles per hour, you will be applying twice the rate per acre of herbicide, assuming you are controlling all other factors.

If you are supposed to operate a particular nozzle set-up for a forty pound per square inch pressure, and because of power difficulties, pressures vary from twenty to sixty pounds, you will apply one-half as much as you should on the low pressure and possibly twice as much or more on the high pressure level.

In addition to being concerned with the right choice of nozzle, the correct level of nozzle tip, the speed of the spray rig and the recommended pressure, you must also consider the effect that wind currents can have on the actual spray pattern. Cross-winds can concentrate a normal twenty=inch band down to a ten= inch band, thus doubling the rate of application of the herbicide to the sprayed area.

The Granular Applicator or Spreader:

Most granular applicators or spreaders utilize either a gravity flow of particles through controlled openings and/or leveling devices to control the amount of granulars that are allowed to fall on the treated area. Flowability of granular herbicides is probably the major key to successful application of graular herbicides. Flowability of granular herbicides varies with the particle size and kind of carrier utilized for any particular chemical. Flowability is also very directly associated with the moisture content of the material and this moisture content involves the previous storage conditions and prevailing humidity during the period of application. In some of our experimental applications, it has been noted that a particular setting which was satisfactory at 8:00 a.m. proved completely wrong at 3:00 p.m.

Our research results indicate that inadequate or excessive rates per acre application of herbicides are much more likely to occur with granulars than with spray materials. These results indicate that growers who use the granular herbicides must exercise special care to avoid mistakes in application.

Spray Drift and Volatility Damage to Adjacent Crops:

The chemicals 2,4-D, 2,4,5-T, or mixtures of the two, can cause damage to adjacent susceptible crops. Vegetable growers generally utilize 2,4-D only for weed control in sweet corn and occasionally in asparagus and potato plantings. The amine salts and low volatile esters of 2,4-D are much safer to use than the iso-propyl or butyl esters of 2,4-D. However, 2,4-D in any form may damage susceptible nearby crops. Growers should evaluate the potential hazard of

their use of 2,4-D, with competent advisers. There are many areas of Ohio, where it is too hazardous to use 2,4-D, particularly on large acreage.

The use of the amine salts or low volatile esters of 2,4-D still represents one of the least expensive methods of chemical weed control that we have available today. Careful use of this chemical should still be considered as a worth-while weed control procedure for Ohio growers.

Growers who use 2,4-D and/or 2,4,5-T should maintain a separate sprayer exclusively, since it is very difficult to remove all traces of these chemicals from a sprayer.

While poor application of any herbicide may result in damage to nearby crops, 2,4-D and 2,4,5-T probably represent the major hazard. Most herbicides can be safely applied, within a few feet of susceptible crops, if reasonable precautions are followed.

Safe use of herbicides cannot be based on "wishful thinking." Safe use of herbicides must be based on a grower understanding of "what he is doing."

GENERAL

There are many additional herbicides suggested and cleared for use on vegetable crops in various areas of the United States. Many of these herbicides have been evaluated under Ohio conditions but are not included in our 1964 suggestions due to poor weed control or the possibility of crop damage.

Vegiben (granular), Enide or Dymid (wettable powders,) and Dacthal (wettable powder) have provided excellent control of weeds, when used on transplanted tomatoes. The latter three materials have also been successfully used in pre-emergence treatments on direct-seeded tomatoes. We have not included these materials, in our standard suggestions pages 8-10. We do feel that growers who are interested in weed control with tomatoes should begin to get some experience with these compounds, on limited acreage. Trial plantings of transplanted peppers, using Enide or Dymid, or Dacthal, would also seem to be worth while, based on research results. Follow label instructions on the above.

Amiben has been recently cleared for pre-emergence use with lima beans. Four years of excellent results with this material on lima beans, leads us to suggest trial applications of this material on lima beans in Ohio.

Growers who are using herbicides should attempt to keep very accurate records on the date and the rate of application of any herbicide used on vegetable crops. All information that can be recorded as related to soil moisture, environmental conditions, stage of crop or weed growth, and apparent results can prove most useful in following seasons. These data can be helpful in cost accounting and also constitute good business procedure. BE SURE THAT YOU READ THE LABEL FOR ANY HERBICIDE THAT YOU USE!

Table 1. Proximate interval between the time of application of certain herbicides on vegetable crop soils and the time when the treated area could be replanted with susceptible vegetable, green manure or cover crops. (a)

Chemical	Rate (b) pounds/acre	"Safe" time (c) interval	Remarks
Alanap (NPA)	4 to 8	2 to 3 weeks	
Amiben or Vegiben	2 to 4	6 to 12 weeks	May be longer on muck soils.
Amino-triazole or -T	4 to 8	8 months (min.)	
Atrazine or Simazine	2 to 3	3 to 6 months	May be longer under dry conditions.
Chloro IPC	4 to 8	3 to 6 weeks	Multiple treatments in a season - a longer hazard.
Dacthal	8 to 12	4 to 12 weeks	
Diphenamide-Dymid or Enide	4 to 8	2 to 6 months	May be longer under dry conditions.
Dowpon (dalapon)	5 to 10	2 to 6 weeks	Work soil well, before replanting.
Eptam (EPTC)	4 to 6	3 to 6 weeks	
Premerge or Sinox PE (dinitro, amine salts)	2 to 4 4 to 8	1 to 2 weeks 2 to 6 weeks	Work soil well, before replanting.
Radox (CDAA)	4 to 8	3 to 6 weeks	
Randox-T (CDAA & TCB.C)	5 to 8 qts.	3 to 6 months	Follow only with field or sweet corn, manufacturer's suggestions.
Sesone (SES)	3 to 6	3 to 6 weeks	
Sodium TCA	3 to 8	2 to 5 weeks	Work soil well, before replanting.
Stoddard Solvent (Carrot oil)	40 to 100 gals.	1 to 5 days	
2,4-D	¼ to 1	2 to 5 weeks	Work soil well, before replanting.
Telvar (monuron)	1 to 3	2 to 6 months	May be longer under dry conditions.
Vegadex (CDEC)	4 to 6	2 to 4 weeks	Usually less, with any pre-crop soil preparation.

(a) Data provided in this table, represent summary research of the Ohio Station, but growers must follow 1964 manufacturer's labels and/or new FDA and USDA interpretation as the 1964 growint season progresses.
(b) Pounds per acre are based on 100 per cent active ingredient.
(c) "Safe" time interval is based on visual symptoms of susceptible crops planted to the treated area and observed over at least a six-week period. However, READ THE LABEL.

Table 2. Common and/or Trade Names of Chemicals Suggested for Use in Weed Control in Vegetable Crops in Ohio for 1964, with Some General Information on Use*

Chemical	Type**	Vegetable Crops	Pre-emergence crop	Post-emergence crop	Remarks Weed Control
Alanap (NPA)	1	cucumber, muskmelon	X	-	Annual weeds
Atrazine	1	sweet corn	X	-	Annual weeds
Chloro IPC	1	lettuce, spinach,	X	-	Annual weeds
		onion	X	X	except lamb's-quarters
Dacthal	1	check label	X	X	annual grasses
Dowpon (dalapon)	2	asparagus	X	-	Annual weeds
		potato (white skin)	pre-planting	-	and perennial grasses
Dow Premerge or Sinox PE (dinitro, amine)		pumpkin and squash	X		
		lima bean, snap bean	X	-	Annual weeds
	2 or 1	potato, sweet corn	X	-	
Eptam (EPTC)		potato	X	X	Annual weeds
Randox (CDAA)	1	lima bean, snap bean	X	-	Annual
		onion	X	X	grasses
		sweet corn	X	-	
Randox T (CDAA+TCBC)	1	sweet corn	X	-	Annual weeds
Sesone	1	asparagus, potato	X	-	Annual weeds
Sodium TCA	2 or 1	beet, cabbage,	X	-	Annual
		cauliflower	X	-	weeds
Stoddard Solvent	3	beet, onion, spinach	X	-	Annual weeds
		carrot, dill	X	X	
		celery seedling	X	X	
		parsley, parsnip	X	X	
Telvar (monuron)	1	asparagus	X	-	Annual weeds
Vegadex (CDEC)	1	cabbage, cauliflower	X	X	Annual weeds
		broccoli	X	X	
		collards, kale	X	-	
		spinach, lettuce	X	-	
		celery	-	X	

*Read the label on the container and be sure that the proposed use has been approved. Use information on 1964 labels only.

**1. Chemical must be applied on soil surface before weeds have emerged.
2. Chemical should be applied on small weed seedlings and residue in soil may provide some control of later emerging weeds.
3. Spray must be applied on small weed seedlings and the chemical has no residual effect on later emerging seedlings.

Suggested Chemical Weed Control Practices with Vegetable Crops, Ohio 1964

Crops	Herbicides	Time of Application	Rate per Acre	Remarks
Asparagus	Monuron (Telvar)	Before or after cutting season.	1 lb. on light soils 2 lbs. on heavy soils or muck.	Apply on moist soil Excellent annual weed control.
	Simazine		(Same as above)	(Same as above)
	Sesone	Right after spring or summer decline.	4 lb. on light soils to 6 lb on heavy soils or muck.	Soil must be moist, with no weeds emerged at time of spraying.
	Dalapon (Dowpon)	Before shoots appear after spring or summer discing.	5 to 10 lb in at least 40 gal water	Excellent control of emerged annual and perennial grasses, particularly quackgrass.
Bean, snap	Dinitro (amine)	Just prior to bean emergence.	3 lb on light soil to 6 lb on heavy soils	Annual weed control. Use lower rates of snap beans
	Dacthal	At time of planting	10 lb	Annual grasses and some broadleaf weeds.
	CDAA (Randox)	At time of planting or 2 days after planting	4 to 6 lb	Good annual grass control
Beet, (garden)	Stoddard solvent	Just prior to beet emergence	60 gal., undiluted	Weeds must have emerged at time of spraying.
	Sodium TCA	Prior to beet emergence	4 to 6 lb	Annual grass control
Broccoli, Cabbage, Cauliflower, and Kale	Dacthal	At time of seeding or transplanting	10 lb	Annual grasses and some broadleaf weeds.
	CDEC (Vegadex)	At time of planting or after transplants established	2-4 lb	Annual weed control. Must be applied before weeds have emerged.
Lettuce	Chloro IPC	Prior to crop emergence	3-4 lb	Muck soil only
	(CDEC (Vegadex))	Same as above	2-4 lb.	Annual weed control

Continued Suggested Chemical Weed Control Practices with Vegetable Crops, Ohio 1964

Crop		Time of Application	Rate per Acre	Remarks
Carrot, dill, parsnip, parsley	Stoddard solvent	Prior to crop emergence or at 2- to 4-leaf stage.	40 to 80 gallons undiluted	Annual weed control except ragweed. Weeds must have emerged at time of spraying.
Celery (seedling)	Stoddard Solvent	Young seedlings 2-leaf stage	60 gallons, undiluted	Annual weed control.
Celery	CDEC (Vegadex)	After plants are well established	2 to 4 lbs	Annual weed control
Onion	Chloro IPC	Just prior to emergence of onions.	6 lb.	Use on muck soil only.
		Apply as a directed spray after onions have emerged. Can be applied two to three times during season. Last spray must precede onion harvest by at least 30 days.	3 to 4 lb.	Onions must be cultivated and hand-weeded just prior to use of Chloro IPC. Use 80 to 100 gallons of water/ acre. Granular applications can also be used.
	CDAA (Randox)	Apply as a directed spray or granular application after onions are well established.	3 to 4 lb.	Good control of annual grasses.
Potato	Dinitro (Amine)	Just prior to emergence of potato plants.	3 to 6 lb.	Do not disturb soil until new flush of weeds are noted after treatment.
	EPTC (Eptam)	Follow label carefully.	--	Soil can be worked after treatment.
Spinach	Stoddard Solvent	Prior to emergence of spinach.	60 gals.	Weeds must be up at time of spraying.
	Chloro IPC	Same as above.	2 lb.	Should be applied before weed emergence.
	CDEC (Vegadex)	At time of planting.	2 to 4 lb.	Annual weed control.

Continued — Suggested Chemical Weed Control Practices with Vegetable Crops, Ohio 1964

Crop	Herbicides	Time of Application	Rate per Acre	Remarks
Sweet Corn	Atrazine	At time of planting	2 lb.	Control of annual weeds.
	2,4-D	Prior to emergence of sweet corn.	½ to 1 lb.	Damage to corn possible on light sandy soils when heavy rain follows treatment.
	Dinitro (amine)	Same as above.	3 to 6 lb.	Same as above.
	CDAA (Randox)	At time of planting	4 lb.	Control of annual grass.
	2,4-D(amine)	Apply at emergence or until corn is two to three inches high or Apply as a directed spray after corn is more than 6-10 inches tall. Use drop-pipes and adjust nozzles to avoid spray contact with corn.	¼ to ½ lb. ¼ to ½ lb.	This treatment should be used only when temperature has been less than 65° F. average. Do not use on North Star. Avoid spraying corn foliage, as much as possible. Avoid spraying corn when average temperature has been 70° to 75° F. for four to five days.
Tomato	(see page 5)			
Cucumbers, Melons	NPA (Alanap)	Apply one or two days after planting the crop.	4 to 6 lb.	Annual weed control. Do not use with very early plantings, when soil is cold and wet.
Squash and pumpkin	Dinitro (amine)	Same as above.	2 to 4 lb.	Control of annual weeds.

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